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LIST OF THE REPTILIA OF THE EOCENE FORMATION OF NEW JERSEY.

BY EDW. D. COPE.

The Eocene Formation occupies in New Jersey, according to Cook, a band extending from near the centre of the State, northeastward, to the Atlantic coast in Mammouth County, in the neighborhood of Deal. Lithologically it consists of a light green glauconite mixed with variable quantities of clay and fine sand. The character of its fossils is marine, including sharks, rays, sawfishes, and swordfishes in great abundance. These forms especially abound in the southwestern part of its area, for example, at Vincenttown, but in the northeastern region reptiles are more abundant, with cetaceans. It is also in that section, near to Shark River especially, overlaid by a thin stratum of loamy sand, which contains fragmentary remains of terrestrial vertebrates of the Miocene period; *e.g.*, *Elotherium*, *Dicotyles*, *Rhinocerus*, etc. Whether the larger mammal described as *Hemicaulodon* (Cope) and *Anchippodus* (Leidy) were derived from this or from the Eocene bed remains uncertain.

The reptiles belong to the *Ophidia*, the *Crocodilia*, and the *Testudinata*, and number only ten species. They are as follows:—

OPHIDIA.

PALÆOPHIS LITTORALIS, Cope.

Proc. Acad. Nat. Sci. Phila., 1868, 234. Trans. Amer. Philos. Soc., XIV. 227.

Shark River.

PALÆOPHIS HALIDANUS, Cope.

l. c. 1868, 235. Tr. A. P. S., XIV. 227. *Dinophis*, Marsh.

Squankum.

PALÆOPHIS GRANDIS Marsh.

(*Dinophis.*) Amer. Journ. Sci. Arts, 1859, 398; Cope Trans. Amer. Philos. Soc., XIV. 228.

Shark River.

TESTUDINATA.

PUPPIGERUS PARVITECTA, Cope.

Trans. Amer. Philos. Soc., XIV. 155 (*Chelone*). *P. parviscutum* (lapsu calami) l. c. 235.

Squankum.

LEMBONAX POLEMICUS, Cope.

Trans. Amer. Philos. Soc., XIV. 168.

Farmingdale.

LEMBONAX PROPYLAEUS, Cope, sp. nov.

Established on an anterior portion of a carapace. This is very peculiar in all respects, and throws much light on the character of the genus. The anterior vertebral or nuchal bone is preserved entire. It is recognized from its combination of a free concave margin, with a basis of attachment of the first dorsal vertebra, and from the first marginal bone on each side symmetrically placed. The sutures thus exposed are very peculiar, and entirely unlike those of any turtle known to me. It is a kind of compound gomphosis, or mixture of the gomphosial and squamosal types. The prominences are long, and penetrate deeply; they are flat, and many grooved on both sides. The suture uniting the nuchal and first costal consists of a median lamina from the former, and two from the latter, fitting into grooves, but deeply grooved, and divided on the edges. That uniting the first marginal is double squamosal, the former entering a groove of the latter, which sends its inferior lamina far under the marginal.

The nuchal is crescent shaped, the anterior or free margin forming the concavity. The horns or external angles are much more produced than is usual in turtles, extending on the inner side of the marginals, and gradually tapering to a point. The middle of the edges of the first marginal takes part in the concavity of the front of the carapace. This concavity is thus more extensive, both in respect to its depth and width, than in any living member of the order, having but a slight representation in some of them. Its edge is subacute in the middle and thickened laterally. It is bordered on each side apparently by a prominent angle for the edge of one (the best preserved) of the marginals turns posteriorly, and is thinned out.

The texture of the bone is closely spongy, with scarcely any dense layer without or within. This point alone distinguishes the form from any found in the cretaceous strata. The external surface of the carapace is smooth, and without trace of sutural grooves of the horny scuta. The carapace is very thick, more so than in any species of the order known, except the *Agomphus firmus*.

Measurements.	M.
Width of nuchal between antero-external angles (above)	0.225
Length do. three inches to right of middle . . .	.11
Thickness	.02
Thickness first marginal	.30

The length of the carapace, if proportioned to the size of the nuchal bone, as in *Chelydra serpentina*, would be forty inches, with the width nearly the same. If the length of head and tail were relatively less than in that species, and more than in the species of *Chelone*, the total length would have been seven and one-half feet.

Of the affinities of the genus little can be said. The characters of the plastron, as I noted when describing the genus, are more those of *Chelydra* than *Chelone*, and the present specimen adds to the weight of the conclusion. The extensive union of the first marginal and nuchal, and of the same with the first costal, are very different from *Chelone*. The character of the sutures is equally distinct from anything seen in *Chelydra*.

As compared with *L. polemicus*, the present reptile is thicker and probably considerably larger. The plastron is usually equal to or thicker than the carapace in tortoises. In the present animal the carapace is much thicker than the plastron of *L. polemicus*. From Farmingdale, Monmouth County, N. J., from the pits of the Freehold and Squankum Marl Company. Presented by the attention of A. J. Smith, director.

LEMBONAX INSULARIS, Cope, sp. nov.

Established on marginal and nuchal bones of a specimen from the Eocene bed of Vincenttown. The first marginal forms a prominent marginal angle, the sutures of the nuchal and second marginal approaching each other at a strong angle. The margin of the nuchal is continuous with the transverse edge of the adjoining marginal, and has not bordered it on the free side for any distance, as is striking in *L. popylaeus*. There has evidently been less concavity of this margin than in that turtle. The suture between the two is also peculiar in not underrunning the marginal to the same extent, and a portion of it underruns the nuchal. It is indeed possible that these bones represent the caudal and adjacent marginals, but the presence of a fragment bearing the support of a vertebra is more suggestive of the nuchal.

A prominent peculiarity of the bone is its great thickness. The first marginal near its suture with the second, measures an inch and three-quarters. The free margin is very thick and obtusely rounded.

	M.
Estimated length first marginal (one edge broken) . .	0.15
Thickness near suture of second	.045
" of nuchal	.033

Should the size of this turtle be proportioned to the thickness of the carapace, or to its relation to corresponding parts of the *L. propylaeus*, it will have been one of the largest species of the order, say from ten to twelve feet in length.

The above descriptions leave much to be desired in regard to the characters of the genus. The peculiarities of the sutures distinguish the form from *Chelydra*, and the association with an especially marine fauna suggests natatory limbs like those of *Propleura* or *Chelone.*

CROCODILIA.

THECACHAMPSA SQUANKENSIS (?Marsh).

Amer. Journ. Sci. Arts, 1869, 391 (*no description*). Cope, Trans. Amer. Philos. Soc., 1869, 65.

Squankum.

THECACHAMPSA SERRATA, Cope, sp. nov.

Established on cervical and dorsal vertebræ of an adult crocodile of about the size of a South American jacare (*J. sclerops*). The teeth are not preserved, so that reference to this genus is only made in consequence of the simple form of the hypapophyses of the cervical vertebræ, a character belonging also to other genera. The neural arches and odontoid element are co-ossified. The axis is compressed concave laterally, and with a very prominent hypapophysial extending on the anterior half keel of the body. The parapophyses are inferior or on the lower plane, and look backwards. They are separated by a concavity from the diapophysial projections, which is continuous with the anterior surface of the odontoid.

In a posterior cervical the cup of the centrum is transverse oval, and the neural canal ample and transverse. The parapophysial articular surfaces are J-shaped, the convexity forwards. The roof of the canal is deeply excavated on the middle line above, and from the fossa thus formed the ridge of the neural spine rises. This ridge is peculiar in the possession of a double row of teeth or serræ separated by pits; on the posterior edge a median series of teeth is most prominent. The edge of the cup is thick, of the ball strongly shouldered, the shoulder obsoletely ridged.

The first dorsal has a similar transverse articular surface and neural canal, and the serration of the neural spine is strongly marked. The parapophysial articular face is an isosceles spherical triangle with the long angle upwards.

	M.
Axis and odontoid, length	0.058
Cervical length (total)	.042
Diameter of cup, outside measure, vertical	.028
Diameter of cup, outside measure, horizontal	.031
Diameter canal, transverse	.02
" neural spine at base	.018

The serration of the neural spines constitutes the most striking peculiarity of this crocodile. The use of the structure cannot be surmised, as they were in large part at least concealed by muscles and integument. It is intermediate in size between the *T. minor* and *T. squankensis.*

Presented to the writer by A. J. Smith, the courteous director of the marl pits of the Farmingdale and Freehold Marl Company. They were found in the Eocene marl of Farmingdale.

?THECACHAMPSA MINOR, Marsh.

Amer. Journ. Sci. Arts, 1870.

The smallest of our crocodiles, stated by Marsh to belong perhaps to the same genus as the *T. squankensis.*